PROGNOSTIC VALUE OF DIFFERENTIAL LEUKOCYTIC COUNT IN ST SEGMENT ELEVATION MYOCARDIAL INFARCTION (STEMI) PATIENTS IN THE EMERGENCY DEPARTMENT

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Introduction

Acute coronary syndrome (ACS) is the main cause of death in affluent countries and one of the major sources of disease burden in developing countries, myocardial infarction (MI) and unstable angina are both ACS conditions. MI is commonly defined as cardio myocyte death caused by substantial and sustained ischemia due to an imbalance of oxygen supply and demand. ST Segment Elevation Myocardial Infarction (STEMI) is the result of transmural ischemia (ischemia that involves the full thickness of the myocardium). The role of hematologic parameters on cardiovascular disease has been investigated, including several types of inflammatory cells such as neutrophils, lymphocytes, monocytes, eosinophils and basophils associated with coronary heart disease. An increase in white blood cell count (leukocytosis) is associated with increased mortality during acute myocardial infarction (AMI) and represents an independent prognostic factor to develop HF and cardiogenic shock. White blood cell count is independent predictor of infarct size in patients with anterior STEMI undergoing primary PCI. When STEMI is suspected, a 12-lead ECG must be acquired and interpreted as soon as possible at the time of first medical contact to facilitate early STEMI diagnosis and triage. PPCI is the standard of care for patients with STEMI presenting with ongoing chest pain.

Aim of the Work

The primary aim of this study was to determine the role of differential total leukocytic count (TLC) in 30-days mortality predication including major adverse cardiac event (MACE) in STEMI patients.

Methodology

This prospective observational study was performed on 200 adult patients diagnosed with STEMI and aligned into two groups:

Group 1: included 53 patients who developed MACE.

Group 2: included 147 patients who didn't develop MACE.

Patients were further categorized into 3 groups according to the WBCs count:

WBC1: (count, <10x103 cells/ml)

WBC2: (count, 10-14.9x10³ cells/ml)

WBC3: (count, ≥15x10³ cells/ml)

All patients were treated by primary percutaneous coronary intervention (PPCI) and the follow up was divided into in hospital follow up & short term One-month follow up after discharge for development of MACE.

Results

Age was significantly higher in WBC3 group compared to WBC1 group and WBC2 group (P value= 0.007) and was significantly higher in WBC1 compared to WBC2 group. BMI and sex were insignificantly different between all groups. The STEMI patients with MACE had higher levels of leukocyte, neutrophil, NLR and lower values of basophils, lymphocytes, and eosinophils. In WBC3 group, MACE was significantly higher compared to WBC1 and WBC2 groups. WBCs can significantly predict incidence of MACE with AUC of 0.646, P value =0.001. At cut off >11.42 with 66.04 % sensitivity, 57.82 % specificity, 1.57 % PPV and 0.59% NPV.WBCs can significantly predict incidence of 30- day mortality with AUC of 0.629, P value =0.045. At cut off >11.42 with 87.50 % sensitivity, 53.13 %specificity, 1.87 % PPV and 0.24% NPV. The mean survival was significantly higher in patients with normal WBCs count compared to patients with abnormal WBCs count (P= 0.037, hazard ratio (95% CI) = 0.23 (0.057 to 0.92).

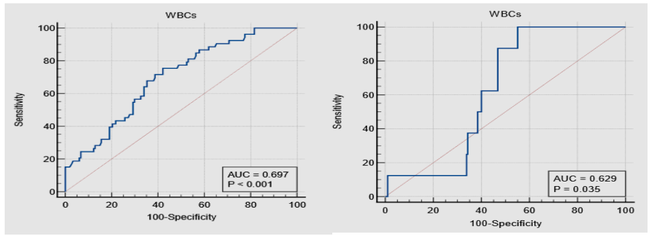

Figure : ROC curve of WBCs in prediction of MACE (A) and in prediction of 30-day mortality (B)

Table 1: Demographic data in relation to white blood cell count (cells/ml) and incidence of MACE in studied groups

		WBC1 (Count, <10x103 cells/ml) (n=91)	WBC2 (Count,1014.9x10³ cells/ml) (n=89)	WBC3 (Count, ≥15x10³ cells/ml) (n=20)	P value	
Sex	Male	56 (61.5)	51 (57.3)	14 (70.0)	0.555	
	Female	35 (38.5)	38 (42.7)	6 (30.0)		
Age (years)		56.62 ± 8.49	54.64 ± 9.74	61.70 ± 7.74	0.007*	P1= 0.307
						P2= 0.060
						P3= 0.005*
BMI (kg/m²)		23.94 ± 4.26	23.73 ±4.43	23.78 ±5.02	0.949	
WBC count and incidence of MACE						
MACE		12 (13.2%)	25 (28.1%)	16 (80.0%)	0.001*	
No MACE		79 (86.8%)	64 (71.9%)	4 (20.0%)		

Data are presented as number (%) or mean ± SD. BMI: body mass index, WBC: White blood cell,
*: significant as p value ≤ 0.05.

Table 2: Leukocytic and differential leukocytic count of the studied groups

	MACEgroup (n=53)	No MACE group (n=147)	P value
Leukocyte 10 9 /L	8.96 ± 2.18	7.33 ± 2.19	0.001*
Neutrophil 10 9 /L	6.85 ± 2.09	4.73 ± 1.97	0.001*
Lymphocyte 10 9 /L	1.42 ± 0.53	1.92 ± 0.65	0.001*
NLR	5.59 ± 2.88	2.76 ± 1.55	0.001*
Monocyte	0.53 ± 0.24	0.48 ± 0.18	0.093
Eosinophil	0.12 ± 0.10	0.17 ± 0.13	0.015*
Basophil	0.03 ± 0.02	0.03 ±0.02	0.040*

Data are presented as mean ± SD.
MACE: major adverse cardiac events.
NLR: neutrophile lymphocyte ratio.
*: significant as p value ≤ 0.05.

Conclusion

- Differential leucocyte count could predict the adverse outcome in STEMI patients where leukocyte, neutrophil and neutrophil lymphocyte ratio and basophil were significantly higher in STEMI patients with MACE with lower lymphocyte and eosinophil.
- WBCs count is a significant predictor of MACE and 30- day mortality at cutoff 11.42 x103 cells/ml.
- Abnormal WBCs count and differentiation contributed to higher mortality rate in STEMI patients.